Energy Efficient Televisions

Technology Push or Regulatory Pull?

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ENERGY EFFICIENT TELEVISIONS – TECHNOLOGY PUSH OR REGULATORY PULL?

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Abstract: The EuP Directive sets the frame for implementing ecodesign requirements for energy-using and energy-related products. The aim of the Directive is to achieve a high level of protection for the environment by reducing the potential environmental impact of energy-related products. The focus of this paper is on the Implementing Measures (IM) for televisions. The ambition level of the IM for televisions is investigated and it is argued that the IM have not succeeded in setting up sufficient ecodesign requirements, as only one life cycle phase and one environmental impact category is addressed. Furthermore, a comparative analysis of best available technology and conventional technologies implies that the standard for the environmental performance of TVs has been driven by technology push rather than a regulatory pull.

1. INTRODUCTION

Climate change, increases in energy consumption, global product chains, and shorter innovation cycles of new technologies and products, etc. are several of the challenges that single countries and the European Union (EU) have tried to address in order to increase the focus on development of more energy and resource efficient products.

A response to these trends from the EU has for 10 years now been the Integrated Product Policy (IPP). The IPP toolbox uses numerous instruments both voluntary and mandatory. Several legislations have implemented the approach, latest the EU Directive on ecodesign requirements for energy-using products (Directive 2005/32/EC) and for energy-related products (Directive 2009/125/EC) The objective of the directives is to contribute *to sustainable development by increasing energy efficiency and the level of protection of the environment, while at the same time increasing the security of the energy supply* [1].

The focus of this paper is the EU Directive 2005/32/EC on ecodesign of energy using products (the EuP Directive) with special attention to the ecodesign requirements for televisions (TV). The aim is to investigate the scope of the Implementing Measures (IM), how ambitious the requirements are, and to what degree they can promote eco-innovation of TVs. First a definition of ecodesign is given, which serves as a realm of understanding what the IM is supposed to achieve. The results of three analyses are presented; 1) a comparison of the IM with the ecolabels, 2) an analysis of the performance of best available technologies (BAT) and the requirements of IM and ecolabels, and 3) a comparative assessment of the performance of conventional technologies and the requirements of IM and ecolabels.

2. METHODS

The study is based on a literature review of the EuP Directive and four ecolabels; The Flower, The Nordic Ecolabel, Energy Star and TCO'06 [2, 3, 4, 5]. Information on power consumption of the TVs in the study has been gathered on the webpages of the producers. The TVs investigated were randomly selected and represent different screen sizes and technologies. TVs from the following brands were investigated:

- Samsung [6, 7]
- Sony [8]
- Panasonic [9]
- LG [10]
- Grundig [11, 12]
- Bang & Olufsen [13]

The investigation of the performance of BAT and conventional technologies was performed in the winter 2009/2010.

3. RESULTS

Before presenting the results of the analyses, a definition of the term ecodesign is necessary in order to understand the scientific meaning of ecodesign.

3.1 Ecodesign

Basically, ecodesign means environmentally conscious product development. Other similar concepts are Design for the Environment and Design for Sustainability [14, 15, 16, 17, 18, 19, 20]. In practice it implies that environmental considerations are integrated with the other considerations when developing products including functional, economic, safety and quality issues. Eco-design focuses on all possible areas of improvements in the product's entire life cycle, from the definition of the function, over selection of raw materials, production methods and transport means, to how the use, recycling and disposal is organised. All relevant environmental properties should be addressed, including material and energy efficiency, emissions and hazardous substances. The aim of ecodesign is to fulfil a need with the least environmental impact, meaning that the function of the product should be the point of departure for future product development [14].

3.2 Comparison of IM and Ecolabels

With the above definition of ecodesign in mind, the scope and level of ambitions of the IM for TVs will be analysed. The IM are compared to four ecolabels. The rationale is twofold; first of all are ecolabels acknowledged by authorities, consumers and producers. Secondly, many years of experience and work lie behind the ecolabels, and the products fulfilling the criteria of eco-labels are considered among the best environmentally performing product in their category without compromising the quality. All ecolabels except the Energy Star consider the entire life cycle of the product and hence are in line with the definition of ecodesign.

In Table 1 the focus areas of the IM and the ecolabels are compared. The narrow focus of the IM on energy consumption in the use phase becomes clear. All ecolabels except the Energy Star focus on general ecodesign requirements, dismantling, life time extension and chemicals, thereby setting requirements to several phases of the products life cycle and to more impact categories. Taking a closer look at the energy requirements on on-mode power consumption, it is evident that the requirements of the IM are not as strict as the ecolabels, see Figure 1. The IM requirements for full HD are for example 1.7 times larger than the Flower requirements for 2009. The IM requirements for 2012 are more than 1.5 times larger than the Flower requirements for 2011. Furthermore, the IM requirements do not set an upper limit for maximum on-mode power consumption, thereby accepting the connection between screen size and power consumption. This is questionable since the trend is towards bigger and bigger screens, with most likely higher power consumption. Both the Nordic and the EU Flower ecolabels have considered this and set a maximum on-mode power consumption of 200W regardless of screen size. With regards to the standby and off-mode requirements, however, the IM requirements fit approximately with the requirements of the ecolabels, see Figure 2.

3.3 Achievements of BAT

After having investigated the ambition level of the IM, the market for current technological trends and possibilities is now analysed. First, the best available technologies (BAT) are investigated. Especially two technologies have a significant positive influence on the environmental impact of TVs; Light Emitting Diodes (LED) and Hot Cathode Fluorescent Lamp (HCFL). These technologies are used by Samsung and Sony respectively. Besides, the efficient backlight technologies Sony has installed a number of features that helps reduce the power consumption even further. These are a presence sensor that detects movement and body heat, and a light censor, which registers the light in the room and adjust the backlight of the TV accordingly. All investigated TV based on the new technologies are labelled with the Nordic Ecolabel. In Figure 1 the BAT is compared to the requirements of the IM and ecolabels.

It is obvious that the TVs based on these new technologies perform significantly better than what is required by the IM, some of the TVs even comply with the Flower requirements of 2013. Is this performance compared to the preparatory studies of the IM, these new technologies were not even mentioned in the study, hence not having an impact on setting up the requirements. However, this is not a surprise as the LED technology was not on the market, when the preparatory studies began. In other words, the process of EuP takes too long in the case of televisions, and furthermore the innovation of new televisions is more driven by a technology push rather than a regulatory pull leading to an improved environmental performance.

3.4 Achievements of Conventional Technologies

The same analysis is made for TVs based on conventional technologies as they are expected to have the most difficulties complying with the requirements of the EuP Directive, see Figure 3. The result is that 32 of the 35 investigated TVs can comply with the IM requirements from August 2010,

whereof 16 can comply with the 2012 requirements. That so many TVs already can comply with the IM requirements, before they step into force, indicates that the requirements of EuP have not been too ambitious. Of course it may have had an influence that the investigation for this paper was performed nearly six months before the requirements steps into force, meaning that the producers have already prepared their products for the forthcoming requirements.

With regards to standby power consumption, four of the six brands have TVs which can comply with the IM requirements for 2011, and all TVs can comply with the requirements that stepped into force January 2010. However, this is not a surprise since the standby requirements had stepped into force by the time of the investigation.

4. DISCUSSION

As shown, the requirements of the IM are first of all *narrower in scope* than what should be expected as the directive aims at ecodesign. A strict focus on energy consumption in the use phase is just one single phase and just one environmental aspect – compared to the comprehensive focus on all potential improvements of the product in ecodesign.

The IM requirements are also narrower than the ecolabels that have set up criteria for important environmental aspects of a television. Obviously, the most important environmental impact stems from energy consumption in the use phase, which is not surprising for energy using products. However, why just consider requirements to energy efficiency, when other types of minimum demands could have been set up to resource efficiency, recyclability, etc.? A broader focus on all areas of improvement would have been in line with ecodesign and ecolabels.

Furthermore, as shown the requirements on on-mode power consumption in the IM are less strict than the ecolabels. This is also a consequence of the fact that ecolabels and IM are different IPP instruments that to some degree have different purposes. The IM are minimum requirements and are mandatory for all product sold in the internal market of EU. Ecolabels, on the other hand, are voluntary and have more strict criteria in order for front-runner enterprises to gain a competitive advantage on the market. The aim of the IM is to exclude the worst performing products from the market, whereas the aim of the ecolabels is to create incentives for producers to innovate cleaner products. Even though the IM requirements are not meant to be as strict as the ecolabels it is necessary to discuss how to create the best synergy between the two policy instruments, and how big the difference should be between the IM requirements and the ecolabel criteria.

Further, it should be noticed that new technology has been introduced since the completion of the preparatory study. This means that new energy efficient technologies have not had an influence on the ambition level of the IM. More specifically was the preparatory study launched in February 2006, the final report finished in August 2007 and the first requirements of the IM came into force in January 2010. In the preparatory study it is mentioned that the TVs investigated are based on expected future sales, hence technologies such as Cathode Ray Tubes (CRT) are considered less important for the study. The focus is therefore on Plasma Panel Displays (PDP) and Liquid Crystal Display (LCD). [21] The LED technology, which has had a significant market introduction in 2009, is not mentioned in the preparatory study at all, meaning that this much more energy efficient technology has not been considered when setting up the requirements of the IM. As shown in figure 1, LED technology is much more efficient, and in this case LED has been a technology push rather than the IM being a regulatory pull towards energy efficient technologies.

This raises the question regarding the EuP process; if it is possible to minimise the time span from the launch of the preparatory study to the requirements steps into force – four years is obviously too long when it comes to electronics.

First of all, it seems as a waste of time and resources that the consultants behind the preparatory studies begin from scratch. At least for the product group, where ecolabels already exist, there is materials and studies available on the environmental impacts of the specific product. A common information platform between voluntary and mandatory measures will reduce the preparation time necessary, and could be a way to inspire broader environmental requirements in the IM of EuP.

Table 1: Focus area of the IM and the ecolabels

Subject	Implementing Measures	EU Flower	Nordic Ecolabel	Energy Star	TCO'06
Power consumption on-mode	■	■	■	■	
Power consumption in off-mode	■		■		
Power consumption in passive standby	■	■	■	■	■
Power consumption active standby low				■	
Maximum energy consumption		■	■	■	
General eco-design requirements		■	■		■
Dismantling		■	■		■
Life-time extension		■	■		
Chemicals in products		■	■		■
Information requirements	■	■	■	■	■
Environmental Management system					■

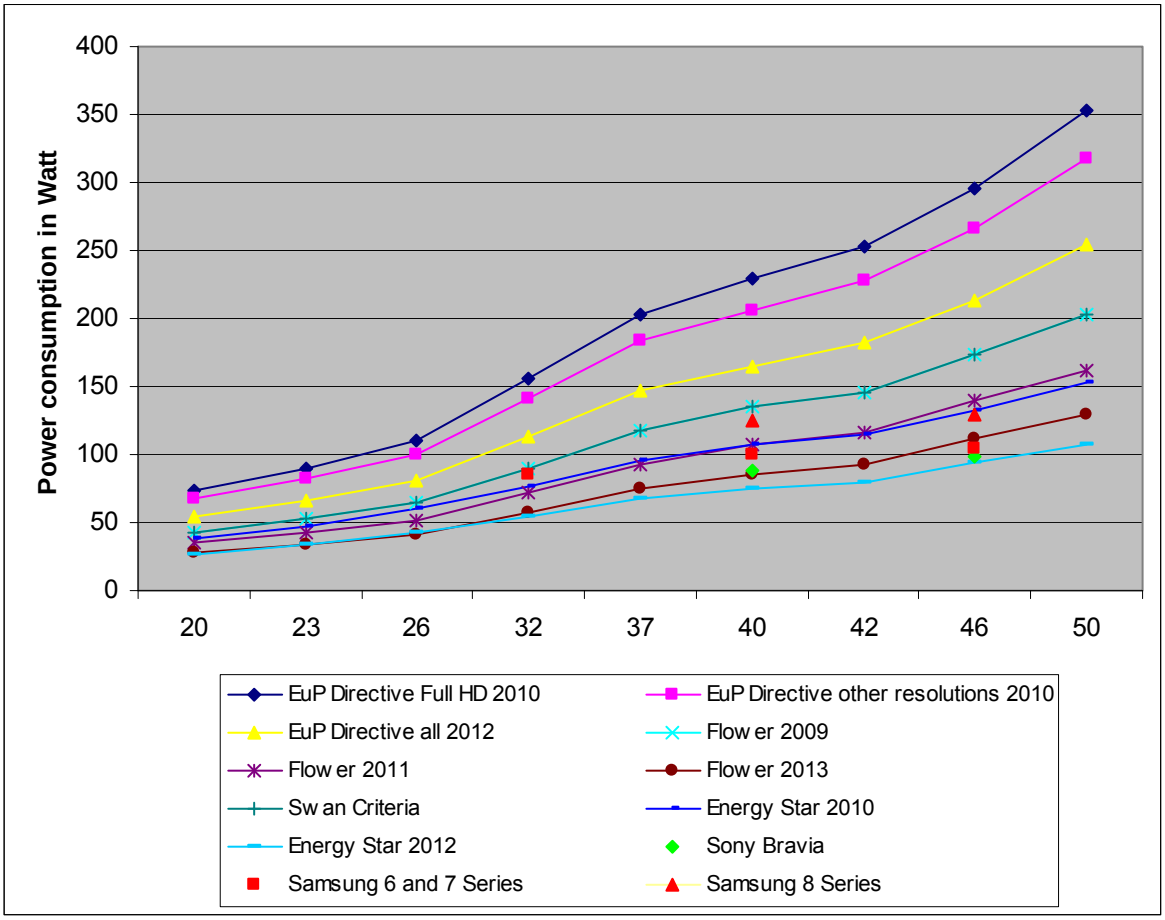

Figure 1: On-mode power consumption requirements of the IM and the ecolabels, and the on-mode power consumption of BAT from Sony and Samsung.

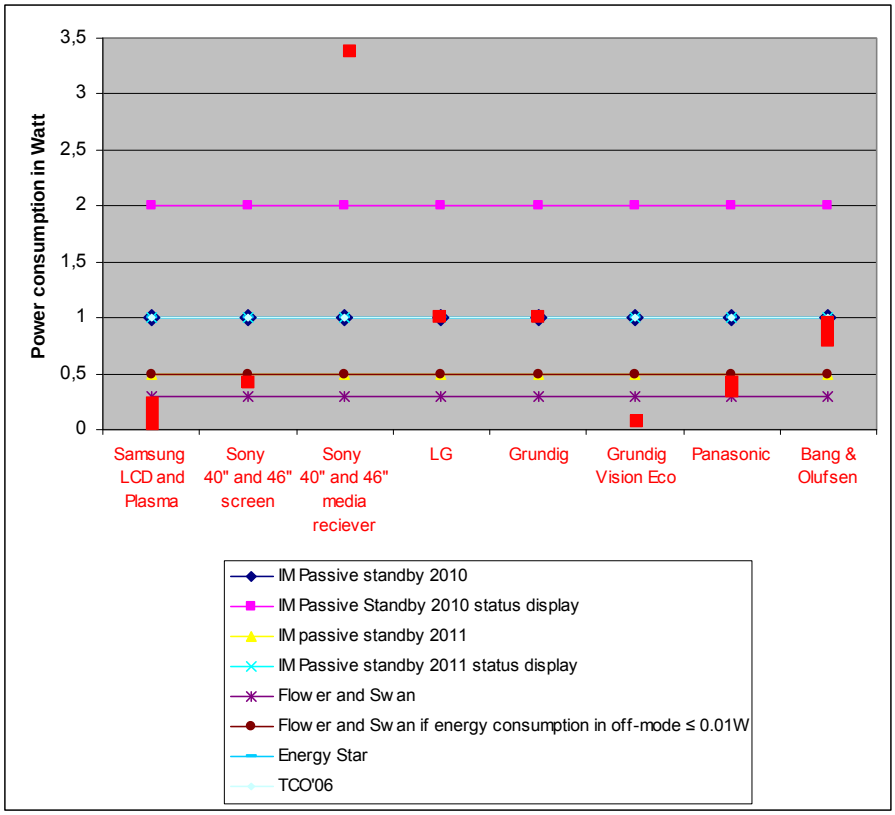

Figure 2: Standby power consumption requirements of the IM and ecolabels, and the standby power consumption of the BAT TVs investigated.

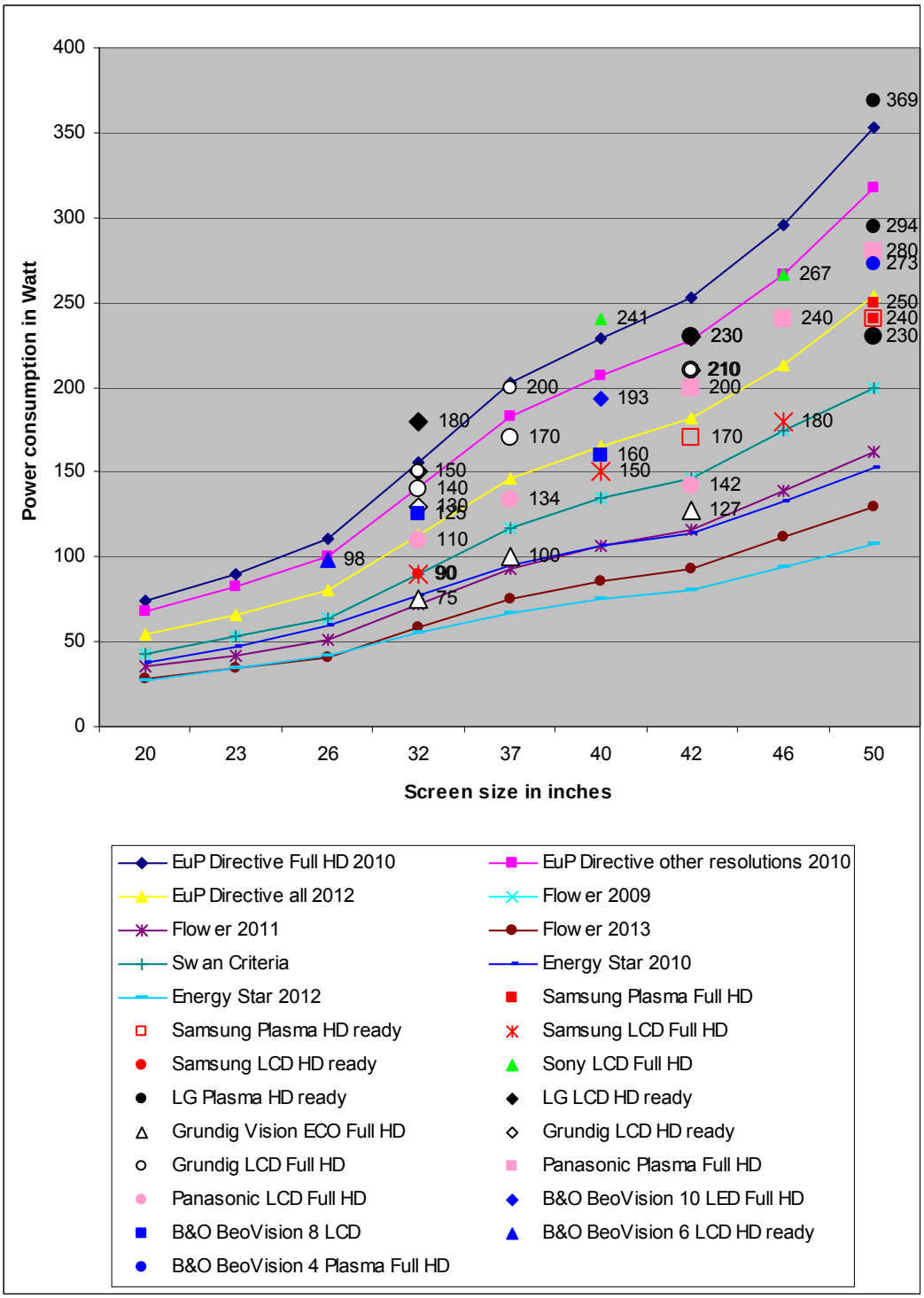

Figure 3: Comparison of conventional technologies, IM and ecolabels

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